the rising air currents where the cliffs converge. Cloud banners have been known to hang over the mountain for hours and sometimes whole days at a time, though these clouds do not often have the appearance and form of a smoke column. A comparison between the altitudes of some common cloud forms and that of the summit of the mountain may be made by referring to figures 3 and 4, taken from the summit and from a spot about half-way up the southern slope, respectively.

A third possible explanation of the phenomenon rests on the fact that there are large patches of rock within the crater rim that are hot enough to vaporize any water that may fall on them. In figure 5, the black surface in the foreground is warm enough to keep the snow melted at all times. A hot surface of this kind lies almost directly under the cliffs forming the crater rim, and it is thought that if a snowslide should occur that would throw a large quantity of snow on that spot, the steam generated could be seen some distance. To the writer's knowledge, this has never been actually seen to occur, but the hypothesis seems plausible; and it is likely if ever such a thing really takes place, the snow slides down during the winter months when it is practically impossible to ascend the mountain.

THE MAKING OF FORECASTS BY LAYMEN.

[U. S. Weather Bureau, Washington, October, 1915.]

[The central office recently addressed the following remarks to the Weather Bureau personnel. We reprint them here because of their undoubted interest to the general public. The bureau desires to encourage the development of the art of forecasting and to stimulate the study of the subject throughout the country. So far as it is possible to transfer the forecasters' experience to paper, the Weather Bureau does so from time to time as is shown by the nature of various articles the bureau has published and expects to publish in the future. The following remarks are made solely in the interest of the public.—C. A., jr.]

No doubt many of the officials of the Weather Bureau have, from time to time in the past, aided in giving currency to the idea that every man can be his own forecaster. In a certain sense this becomes possible if there is some familiarity with the source of weather forecasting and if a weather map of recent date is available.

In view of the difficulties of accurate forecasting in the long run, however, it seems desirable not to encourage a too literal acceptance of the idea in question. Especially is this the case where the impression exists on the part of horticulturists, business men, and others who may have important interests at stake in connection with forthcoming weather conditions, that their own ability to forecast the coming weather is sufficient for their guidance in the conduct of their business or agricultural affairs.

The reasons for the caution here advanced, and which should be conveyed to those inclined to depend too largely on their own knowledge of the weather map, should be sufficiently obvious to the members of the Weather Bureau. Experience has already fully demonstrated that, while the recognized principles of weather forecasting are common property in so far as concerns the fact that they have been set forth in numerous publications, very few even among those who give their daily attention to the subject have developed exceptional skill in making the forecasts. Furthermore, the weather maps as issued—which must necessarily be the sole basis of an individual forecast—do not contain all of the information that has passed under the scrutiny of the official forecaster before he issues the forecasts and warnings. Not only at the district forecast centers, but to a larger extent at the Washington office, there are prepared supplementary charts covering the changes in pressure and temperature within a given preceding period, etc., which play their part in the final determination of the forecast issued.

It will thus be readily seen that, whatever may be the justification for an individual to attempt to make his own deductions from the weather map with reference to his particular interests, it will be much better for him to place his reliance upon the official forecasts and information issued by the Weather Bureau. These considerations justify the Weather Bureau in discouraging the idea that satisfactory forecasts can be made by anyone merely because he possesses a fair knowledge of meteorological laws.—*C. F. Marvin, Chief of Bureau.*

PROFESSOR CLEVELAND ABBE.

[U. S. Weather Bureau, Washington, D. C., Dec. 3, 1915.]

The news that Professor Cleveland Abbe has been under the necessity of taking an extended leave of absence on account of ill health will be received with regret not only by his coworkers in the Weather Bureau, but throughout the scientific world.

Professor Abbe [who is now just 77] has had 44 years of distinguished service in the Weather Service and Weather Bureau of the Government. Through his exexcellent work and eminence in the application of meteorology he has come to be regarded as the "dean of the Weather Service." During this period he has been indefatigable in the pursuit of his favorite branch of science, while his enthusiasm served to enlist the interest of a number of young students who later made their mark in the development of meteorology as a science.

Professor Abbe's long and able editorship of the MONTHLY WEATHER REVIEW and his numerous contributions to meteorological science are well known to the members of the Weather Bureau, as well as to meteorologists the world over, all of whom will wish for him a complete recovery and an early return to the congenial duties in which he has been engaged for so many years.

The above was recently communicated to the personnel of the Weather Bureau, but is also of interest to other readers of the REVIEW.—C. A., jr.

PENNSYLVANIA WEATHER AND CLIMATE IN 1682.

William Penn, founder of the State of Pennsylvania, first trod the soil of the land on the Delaware, granted him by Charles II of Britain, on October 28, 1682. Before this time he had actively agitated the advantages of country life and of emigration to the New World, had drafted a form of government for his colony, and had actually sold as much as 600,000 acres of his grant to prospective settlers. Numerous settlers had preceded Penn, a multitude accompanied and immediately followed him; and by the time he wrote the *Letter* quoted below, settlements dotted the rivers several miles inland. Along the Delaware River settlements reached from Lewes to above the Falls at Trenton, and shortly before writing the *Letter* Penn had made a general tour of his lands so that he had freshly in mind full information from his own observations.

The original draft of the *Letter* is preserved by the Historical Society of Pennsylvania. Published versions

of the *Letter* appeared in English, Dutch, German, and French. The original English edition was published by Andrew Sowle in London in 1683 and a fac-simile of its title page is published in an important historical work by Julius Friederich Sachse.[1] A fac-simile of the English edition was reproduced by James Coleman of London in 1881. One of the early German translations in manuscript is in the Royal Privy Archives in Munich; it has been photographed and published by Prof. Marion Dexter Learned[2] and also published by Emil Heuser.[3]

Penn's letter is of some interest to us today because it presents an excellent description of the weather, seasons, and climate of Pennsylvania in 1682 and 1683. The following extract presents those paragraphs treating of the meteorological conditions of his colony; it is from the text published by A. C. Myers,[4] who followed the fac-simile English edition by Coleman in 1881. Those interested in these early documents bearing on the history of our country are referred to Mr. Myers' volume.

LETTER FROM WILLIAM PENN TO THE COMMITTEE OF THE FREE SOCIETY OF TRADERS, 1683.[4]

My kind Friends;

* * * * *

I. The country it self in its soyl, air, water, seasons and produce both natural and artificial is not to be despised. The land containeth divers sorts of earth, as sand yellow and black, poor and rich: also gravel both loomy and dusty; and in some places a fast fat earth, like to our best vales in England, especially by inland brooks and rivers, God in his wisdom having ordered it so, that the advantages of the country are divided, the back lands being generally three to one richer than those that lie by navigable waters. We have much of another soyl, and that is a black hasel mold, upon a stony or rocky bottom.

II. The air is sweet and clear, the heavens serene, like the south-parts of France, rarely overcast; and as the woods come by numbers of people to be more clear'd, that it self will refine.

III. The waters are generally good, for the rivers and brooks have mostly gravel and stony bottoms, and in number hardly credible. We have also mineral waters, that operate in the same manner with Barnet[5] and North-hall,[6] not two miles from Philadelphia.

IV. For the seasons of the year, having by God's goodness now lived over the coldest and hottest, that the oldest liver in the Province can remember, I can say something to an English understanding.

1*st*, Of the Fall, for then I came in: I found it from the 24th of October, to the beginning of December, as we have it usually in England in September, or rather like an English mild Spring. From December to the beginning of the moneth called March, we had sharp frosty weather; not foul, thick, black weather, as our north-east winds bring with them in England; but a skie as clear as in Summer, and the air dry, cold, piercing and hungry; yet I remember not, that I wore more clothes than in England. The reason of this cold is given from the great lakes that are fed by the fountains of Canada. The winter before [i. e. of 1681-82] was as mild, scarce any ice at all; while this [winter] for a few days froze up our great River Delaware. From that moneth to the moneth called June, we enjoy'd a sweet Spring, no gusts but gentle showers, and a fine skie. Yet this I observe, that the winds here as there, are more inconstant in Spring and Fall, upon that turn of Nature, than in Summer or Winter. From thence to this present moneth, which endeth the Summer (commonly speaking) we have had extraordinary heats, yet mitigated sometimes by cool breezese. The wind that ruleth the Summer-season, is the south-west; but Spring, Fall and Winter, 'tis rare to want the wholesome north wester seven dayes together: and whatever mists, fogs, or vapours foul the heavens by easterly or southerly winds, in two hours time are blown away; the one is always followed by the other: a remedy that seems to have a peculiar Providence in it to the inhabitants; the multitude of trees, yet standing, being liable to retain mists and vapours, and yet not on quarter so thick as I expected.

V. The natural produce of the country, of vegetables, is trees, fruits, plants, flowers. The trees of most note are, the black walnut, cedar, cyprus, chestnut, poplar, gumwood, hickery, sassafrax, ash, beech and oak of divers sorts, as red, white and black; Spanish chestnut and swamp, the most durable of all: of all which there is plenty for the use of man.

The fruits that I find in the woods, are the white and black mulberry, chestnut, wallnut, plumbs, strawberries, cranberries, hurtleberries and grapes of divers sorts. The great red grape (now ripe) called by ignorance, the fox-grape (because of the relish it hath with unskilful palates) is in it self an extraordinary grape, and by art doubtless may be cultivated to an excellent wine, if not so sweet, yet little inferior to the Frontimack, as it is not much unlike in taste, ruddiness set aside, which in such things, as well as mankind, differs the case much. There is a white kind of muskedel, and a little black grape, like the cluster-grape of England, not yet so ripe as the other; but they tell me, when ripe, sweeter, and that they only want skilful vinerons to make good use of them: I intend to venture on it with my French man this season, who shews some knowledge in those things. Here are also peaches, and very good, and in great quantities, not an Indian plantation without them; but whether naturally here at first, I know not, however one may have them by bushels for little; they make a pleasant drink and I think not inferior to any peach you have in England, except the true Newington. 'Tis disputable with me, whether it be best to fall fining the fruits of the country, especially the grape, by the care and skill of art, or send for forreign stems and sets, already good and approved. It seems most reasonable to believe, that not only a thing groweth best, where it naturally grows; but will hardly be equalled by another species of the same kind, that doth not naturally grow there. But to solve the doubt, I intend, if God give me life, to try both, and hope the consequence will be as good wine as any European countries of the same latitude do yield.

* * * * *

Your kind cordial friend,

WILLIAM PENN.

Philadelphia, the 16th of the 6th Moneth, call'd August, 1683.

Penn goes on to describe and discuss the fauna by land and sea, the Indians and their language, customs, laws, other European settlements, and the interests of the company. Since our interests center chiefly on the meteorological and climatological conditions, with their effects on agriculture, we need not continue Penn's text.

To one who pays systematic attention to the weather and climate of the eastern United States, particularly of the Middle Atlantic States, the quoted passages from Penn's hand convey a clear idea of the weather he had experienced. Although he lacked precise instrumental aids, the latter could not have improved his description and his recognition of the characteristic weather features. We of to-day can see at once that the general and actually important features of Atlantic coast weather and climate were the same in 1682 and 1683 as now. The "extraordinary heats" from June to August are no strangers to us of the present; and the actual construction of the better houses throughout Maryland and Virginia bear testimony to those "cool breezes" from the southwest in summer.

Penn's description of the winter in the Middle Atlantic seaboard fits the present as well as it undoubtedly describes the past. His explanation of the cold as "given by the great lakes that are fed by the fountains of Canada" would not hold to-day. We find a better one in an account by David de Vriess[7] who was exploring the Delaware during February, 1633. On his return to his ship the men—

Did not imagine that we had been frozen up in the river, as no pilot or astrologer could conceive, that in a latitude from the thirty-eighth and a half to the thirty-ninth, such rapid running rivers could freeze. Some maintain that it is because it lies so far west; others adduce other reasons; but I will tell how it can be, from experience and what I have seen, and that is thus: inland, stretching towards the north, there are high mountains, covered with snow, and the north and northwest winds blow over the land from these cold mountains, with a pure, clear

[1] *Sachse, Jul. Fr.* The Fatherland: (1450-1700) showing the part it bore in the discovery, exploration, and development of the western continent, with special reference to the commonwealth of Pennsylvania. Part I. ... Philadelphia, 1897. 8°. p. 191, plate xix.

[2] *Learned, Marion D.* German translation of William Penn's letter to the Free Society of Merchants in London, 1683. Germ. amer. annals, Philadelphia, 1910, (O.S.), 12.52-75, illus.

[3] *Heuser, Emil.* Pennsylvanien im 17. Jahrhundert und die ausgewandertem Pfälzer in England. Mit 3 Faksimile-Drucken. Neustadt a. d. Hardt 1910. [iv] 82p. 12°.

[4] *Extract from* **Myers, Albert Cook.** Narratives of early Pennsylvania, West New Jersey and Delaware, 16:0-1707. New York, 1912. 8°. (Original narratives of early American history.) p. 224-244.

[5] I. e. Chipping Barnet, or High Barnet, Hertfordshire, 11 mis. north of London. It has a mineral spring on the town common.—A. C. M.

[6] Northaw, Hertfordshire, about 4 miles northeast of Chipping Barnet, has a fine saline spring formerly much resorted to.—A. C. M.

[7] *A. C. Myers*, op. cit., pp. 25-26.

air, which causes extreme cold and frost, such as is felt in Provence and Italy, which I have often experienced when I was at Genoa, when the wind blew over the land from the high mountains, making it as cold as it was in Holland. I have found by experience in all countries, during winter, that when the wind blows from the land the hardest frost makes. It is so in New Netherland also, for as soon as the wind is southwest, it is so warm that one may stand naked in the woods, and put on a shirt.

Again Penn's idea that clearing away the trees would improve the cloudiness or fogginess, while representative of his times, would not be generally accepted to-day as a safe method to follow. However, his observations show a keen appreciation of nature; and we are fortunate in having his letter preserved. It helps to forge one more link in the chain of evidence tending to prove that no permanent discernable change has been taking place in our climate.

One phenomenon of interest is not recorded in the extracts above. Penn makes no mention of the weather which we call "Indian summer." Two explanations for the omission occur to the writer: (1) A busy administrator might have failed to remark the season, experiencing it but once. Indian summer is often not well marked, and attracts attention rather by its repetition than by striking characteristics; Penn had been here but one year when he wrote his letter. (2) The fall of 1682 may not have presented a recognizable Indian summer at all, so that Penn really had not had an opportunity to observe it in America. However, Penn must have subsequently experienced many such Indian summers, and so acute an observer must have described this season somewhere in his writings. Can we find those descriptions, and does he there employ the term "Indian Summer"?[8]—C. A., jr.

ON WATERFALL ELECTRICITY AND ON THE SURFACE CONDITION OF LIQUIDS.[1]

By P. LENARD.

[*Reprinted from* Science Abstracts, Sec. A, Oct. 25, 1915, § 1416.]

The present communication forms part of a larger work on the problem of complex molecules. Under the name "waterfall electricity" the author includes the electrical phenomena accompanying waterfalls, splashing brooks, and rain, also water jets and drops as produced in the laboratory. In these cases the water becomes positively electrified while the negative charge passes into the air. Experiments have also been undertaken of bubbling air through water and of breaking water into spray, and the same phenomena found, so that these latter are classified under waterfall effects. For explaining these electrical accompaniments the liquid surfaces are assumed to be the seat of an electrified double layer, and the observed effects are due to the separation of this double layer whereby a charge of one sign remains in the liquid while the opposite one passes into the surrounding atmosphere. The varying forms of the effect are due to the different modes of separation. The present paper contains an investigation into the mechanism of the waterfall effect, and into the behavior of liquid surfaces considered as the seat of electrical and material stratification.

Section I deals with the superficial concentration of complex molecules and the forces operating on them. Here the idea of complex molecules receives detailed explanation, their distribution in the surface layer is considered, and the dimensions of the superficial forces comprehensively treated.

Section II deals with the waterfall effect as a consequence of the electrical nature of the molecular forces. First comes a detailed treatment of the electrified double layer at the surface; the surface tension in vacuo is found to be not much different from its value in air, while there is no frictional electricity developed between water and air. The rapid disappearance of liquid surface (e. g., by impact on a wetted surface, by water drops falling into water, or by coalescence of drops) is next considered, and the conclusion drawn that the separation between air and water is not the active agent in the production of the waterfall effect. Ordinary distribution of fluid is ineffective; spraying, on the other hand, brings about the effect, and in general the separation of very small liquid particles from the surface acts as a fundamental cause. The waterfall theory of thunderstorms is next exhaustively discussed. Important evidence that contact electricity between gas and liquid is not the origin of waterfall effects is afforded by the very small influence which the nature of the gas exerts, comparative experiments having been undertaken with hydrogen, methane, nitrogen, carbon monoxide, air, and oxygen.

Section III deals specially with the surface conditions of fluids. Every liquid surface has been found to consist of a number of strata which are both electrically and materially different from each other, and such stratification extends to a depth equal to the sphere of activity. From a knowledge of these strata may be gathered an insight into such surface phenomena as surface tension, waterfall effect, photoelectric activity, etc, also the influence of dissolved substances. Purely dielectric fluids, such as water, alcohol, benzol, are first considered, the surface constitution, the field strength of the double layer, and the waterfall effect being critically examined. Following this comes the behavior, from every standpoint, of dissociated nonvolatile electrolytes, i. e., dilute aqueous salt solutions, and a comparison is made by varying the anions and kathions. The nature of the carriers of the various electrical effects is next discussed. Partially dissociated nonvolatile electrolyte, e. g., concentrated salt solutions, then receive attention, followed by undissociated nonvolatile fluids—for instance, sugar solution. Solutions of volatile solutions, such as aqueous solutions of hydrochloric acid, ammonia, alcohol, and ether are then treated and finally the surface behavior of metallic mercury is considered.

Some of the general conclusions are as follows: A simple expression has been found for the surface concentration of solutions of nonvolatile substances and analogous fluid mixtures. An insight was afforded into the surface behavior of liquids containing molecules of different dimensions, by an investigation into the dependence between the molecular surface forces and molecular volumes. It has been shown in six different ways that the electrified double layer whose presence at liquid surfaces is shown by the waterfall effect, does not originate through contact electricity between gas and fluid, but that its seat is entirely within the fluid in such a way that the external molecular layer is negatively and the interior layer positively charged. The cause of this double layer lies in the electrical nature of the molecular forces, and in like manner can be regarded the phenomenon of contact electricity on dielectric bodies. The different forms of the waterfall effect, as also its presence under certain conditions and its absence in others, are explained from

[8] It is well-known that the Swedish pastor John Campanius kept weather records 40 years earlier than this letter, at the Swedish settlement in Delaware. A reference to his observations is given in this REVIEW, December, 1901, 29: 565: and a summary of his observations is printed in the Climatological Summary for the Maryland-Delaware Section, November and December, 1901. They have been presented by Nicholas Collin in Trans. Amer. Phil. Soc., Philadelphia, 1818, 1:340-352, in connection with later observations from other sources, and published in detail by Campanius' grandson in "Kort beskrifning om Nya Sverige," Stockholm, 1702, 4°.

[1] *See* Ann. d. Physik, July 8, 1915, 47 IV: 463-524.